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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/544,129	08/02/2005	Satoshi Takei	124936	8585

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EXAMINER	
EOFF, ANCA	
ART UNIT	PAPER NUMBER
1795	
MAIL DATE	DELIVERY MODE
06/11/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/544,129	TAKEI ET AL.	
	Examiner	Art Unit	
	ANCA EOFF	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 April 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 6-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 6-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1, 2 and 6-10 are pending in the application. Claims 3-5 have been canceled.

2. The foreign priority document JP 2003-044045, filed on February 21, 2003 was received and acknowledged. However, in order to benefit of the earlier filing date, a certified English translation is required.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 02, 2009 has been entered.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 2, 6 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takei et al. (WO 02/05035, wherein the citations are from the English equivalent document, US Pg-Pub 2003/0146416).

With regard to claims 1, Takei et al. disclose a composition for forming a gap-filling material for lithography, wherein said material is used for producing semiconductor devices by a method using the gap filling material to apply the resist on a substrate having holes with an aspect ratio of 1 or more, to transfer images onto the substrate by utilization of lithographic process (abstract). The composition for forming a gap-filling material comprises a polymer, a solvent (abstract) and a crosslinking agent (par.0095).

Takei et al. further disclose that the polymer is preferably a polymer that contains at least one or more hydroxyl groups per repeating unit. Examples thereof include polymers obtained by polymerizing compounds such as hydroxyalkyl acrylates or hydroxyalkyl methacrylates (par.0061).

As hydroxyalkyl acrylates, Takei et al. specifically disclose:

- hydroxyethyl acrylate (par.0064), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a hydrogen atom, p=1, q=0 and R_2 is a hydrogen atom;

- hydroxypropyl acrylate (par.0064), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a hydrogen atom, p=2, q=0 and R_2 is a hydrogen atom, and

- hydroxybutyl acrylate (par.0064), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a hydrogen atom, p=3, q=0 and R_2 is a hydrogen atom.

As hydroxyalkyl methacrylates, Takei et al. specifically disclose:

-hydroxyethyl acrylate (par.0065), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a methyl group, p=1, q=0 and R_2 is a hydrogen atom;

- hydroxypropyl acrylate (par.0065), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a methyl group, p=2, q=0 and R_2 is a hydrogen atom, and

- hydroxybutyl acrylate(par.0065), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a methyl group, p=3, q=0 and R_2 is a hydrogen atom.

Takei et al. further disclose that the weight average molecular weight of the polymer is preferably between 1,000 and 30,000 (par.0060), which encompasses the range for molecular weight of the instant application.

Takei et al. do not specifically disclose a polymer comprising only units derived from the hydroxyalkyl (meth)acrylates mentioned above and having the weight molecular weight in the range of 5,000 to 20,000. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain such a polymer, based on Takei's teachings that polymers comprising at least one hydroxyl group per repeating unit may be obtained by polymerizing hydroxyalkyl (meth)acrylates (par.0061)

and the teaching regarding the preferred weight average molecular weight of the polymers (par.0060).

In Synthetic Examples 2 and 3 (par.0019 and par.0123), Takei et al. disclose polymers having weight average molecular weights of 5,300 and respectively 19,000. Therefore, one of ordinary skill in the art at the time of the invention would have been motivated to obtain polymers with weight average molecular weights in this range. Such polymers would satisfy the limitation of "containing components having a molecular weight of 3,000 or less in a rate of 20% or less".

Takei et al. disclose that the solvent used for the composition for forming gap-filling material preferably has a boiling point in the range of 145-220°C (par.0098) and may be butyl lactate, cyclohexanone, propylene glycol monobutyl ether or propylene glycol monomethyl ether acetate (par.0097).

With regard to claim 2, Takei et al. disclose a composition for forming a gap-filling material for lithography, wherein said material is used for producing semiconductor devices by a method using the gap filling material to cover the resist on a substrate having holes with an aspect ratio of 1 or more, to transfer images onto the substrate by utilization of lithographic process (abstract). The composition for forming a gap-filling material comprises a polymer, a solvent (abstract) and a crosslinking agent (par.0095).

Takei et al. further disclose that the polymer is preferably a polymer that contains at least one or more hydroxyl groups per repeating unit and examples thereof include thermoplastic polymers obtained by polymerizing compounds such as hydroxyalkyl acrylates or hydroxyalkyl methacrylates (par.0061).

As hydroxyalkyl acrylates, Takei et al. specifically disclose:

- hydroxyethyl acrylate (par.0064), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a hydrogen atom, p=1, q=0 and R_2 is a hydrogen atom;

- hydroxypropyl acrylate (par.0064), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a hydrogen atom, p=2, q=0 and R_2 is a hydrogen atom, and

- hydroxybutyl acrylate (par.0064), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a hydrogen atom, p=3, q=0 and R_2 is a hydrogen atom.

As hydroxyalkyl methacrylates, Takei et al. specifically disclose:

-hydroxyethyl acrylate (par.0065), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a methyl group, p=1, q=0 and R_2 is a hydrogen atom;

- hydroxypropyl acrylate (par.0065), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a methyl group, p=2, q=0 and R_2 is a hydrogen atom, and

- hydroxybutyl acrylate(par.0065), which is equivalent to the compound of formula (1) of the instant application, wherein R_1 is a methyl group, p=3, q=0 and R_2 is a hydrogen atom.

Takei et al. further disclose that the above-mentioned polymer can be copolymerized with an uncrosslinkable monomer, so that the dry-etching speed and

reflectivity can be finely adjusted and such co-polymerizable monomer includes alkyl acrylates and alkyl methacrylates having alkyl groups of 1 to 10 carbon atoms (par.0071 and par.0073-0074).

Takei et al. further disclose that the weight average molecular weight of the polymer is preferably between 1,000 and 30,000 (par.0060), which encompasses the range of the instant application.

While Takei et al. do not specifically disclose a polymer comprising only units derived from the hydroxyalkyl (meth)acrylates and the alkyl (meth)acrylates and having the wieight molecular weight in the range of 5,000 to 20,000, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain such a polymer, based on Takei's teachings that polymers comprising at least one hydroxyl group per repeating unit may be obtain by co-polymerizing hydroxyalkyl (meth) acrylates (par.0061) with uncrosslinkable monomers, such as alkyl (meth) acrylates in order to finely adjust the reflectivity and dry etching speed (par.0071) and the teaching regarding the preferred weight average molecular weight of the polymers (par.0060).

Takei et al. further disclose that the repeating unit which comprises a hydroxyl group may represent 20-80% of the repeating units of the polymers (par.0090-0093) and gives examples wherein the repeating unit which comprises a hydroxyl group represents 70% molar (par.0016) and respectively 49% molar (par.0120).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain polymer comprising a repeating unit containing a hydroxyl group in an amount preferably between 20-80% of the repeating units of the polymer,

wherein the repeating unit containing a hydroxyl group may be hydroxyalkyl (meth) acrylates.

In Synthetic Examples 2 and 3 (par.0019 and par.0123), Takei et al. disclose polymers having weight average molecular weights of 5,300 and respectively 19,000. Therefore, one of ordinary skill in the art at the time of the invention would have been motivated to obtain polymers with weight average molecular weights in this range. Such polymers would satisfy the limitation of "containing components having a molecular weight of 3,000 or less in a rate of 20% or less".

Takei et al. disclose that the solvent used for the composition for forming gap-filling material preferably has a boiling point in the range of 145-220°C (par.0098) and may be butyl lactate, cyclohexanone, propylene glycol monobutyl ether or propylene glycol monomethyl ether acetate (par.0097).

With regard to claim 6, Takei et al. disclose that the crosslinker used for the composition for forming gap-filling material has at least two cross-linking forming functional groups (par.0095).

With regard to claims 8-10, Takei et al. disclose a semiconductor device manufacturing method comprising the following steps:

-a step (A) in which the composition for gap-filling material is applied to a substrate having holes with an aspect ratio or 1 or above and then is dried to form a planarized filling layer on the substrate (par.0107);

- a step (B) in which the resist is applied and dried (par.01018), and

- a step (C) in which an exposure and development are performed (par.0109).

Takei et al. also disclose that a bottom anti-reflective coating can be formed before or after the formation of the filling layer using the composition for forming gap-filling material in the above step (A) (par.0109).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takei et al. (WO 02/05035, wherein the citations are from the English equivalent document, US Pg-Pub 2003/0146416) as applied to claim 1 above and in further view of Rutter et al. (US Pg-Pub 2002/0110665).

With regard to claim 7, Takei et al. teach the composition for forming a gap-filling material of claim 1 (see paragraph 4 of the Office Action) but fail to teach that the composition comprises an acid or an acid generator.

Rutter et al. disclose an aperture fill material, comprising a cross-linkable polymer with hydroxyl groups, one or more crosslinking agents, one or more acid catalysts and a solvent (par.0026).

The acid catalysts are added to the composition to catalyze the crosslinking of the polymer and crosslinking agent (par.0051) and may be free acids or acid generators.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the acid catalysts (free acid or acid generators) disclosed by Rutter et al. in the composition for forming a gap-filling material of Takei et al., in order to catalyze the crosslinking of the polymer and crosslinking agent.

Response to Arguments

7. Applicant's arguments with respect to claims 1, 2 and 6-10, see the Remarks filed on April 02, 2009 have been considered but are moot in view of the new grounds of rejection.

On pages 5-6 of the Remarks, the applicant presents the features claimed in the amended independent claims 1 and 2 of the instant application.

On pages 7-8, the applicant argues that Takei et al. (WO 02/05035, wherein the citations are from the English equivalent document, US Pg-Pub 2003/0146416) do not disclose the polymers of claims 1 and 2 but disclose 53 possible compounds that may be polymerized to be the polymer of the gap-filling material. In contrast, claim 1 recites a polymer with one specific structure and claim 2 recites a polymer with two specific structures.

The examiner would like to point out that the previous Office Action did not assert that Takei et al. specifically teach the polymers of claims 1 and 2 but that one of ordinary skill in the art would be motivated to obtain the polymers of claims 1 and 2, based on Takei's teachings regarding the polymers for the gap-filling material.

One of ordinary skill in the art would have been motivated to obtain the polymer comprising only the monomer (1), as in claim 1 of the instant application, based on Takei's teachings regarding the preferred monomers for polymers with 1 or more hydroxyl groups (par.0061) and the specific disclosure of the preferred monomers (par.0064-0065). Takei specifically teaches the same monomers that applicant

discloses and Takei teaches that the monomers are used in polymers. Therefore, the previous of rejection of Takei is maintained.

Also, one of ordinary skill in the art would have been motivated to obtain the polymer of claim 2, based on Takei's teachings that polymers comprising at least one hydroxyl group per repeating unit may be obtain by co-polymerizing hydroxyalkyl (meth) acrylates (par.0061) with uncrosslinkable monomers, such as alkyl (meth) acrylates in order to finely adjust the reflectivity and dry etching speed (par.0071).

On page 7 of the Remarks the applicant argues that Takei et al. disclose 34 solvents, which may be used individually or in combination of two or more. In contrast, claims 1 and 2 of the instant application recite five specific solvents.

However, the applicant would like to show that the solvents of claims 1 and 2 are clearly taught by Takei et al. (par.0097) so one of ordinary skill in the art would have been motivated to use them for a gap-filling material.

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in KSR noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Court quoting In re Kahn, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), stated that "[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" KSR, 550 U.S. at___, 82 USPQ2d at 1396. Exemplary rationales that may support a conclusion of obviousness include:

(A) Combining prior art elements according to known methods to yield predictable results;

(B) Simple substitution of one known element for another to obtain predictable results;

(C) Use of known technique to improve similar devices (methods, or products) in the same way;

(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

(E) " Obvious to try " – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;

(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. (MPEP 2100).

On page 9 of the Remarks, the applicant argues that Rutter et al. does not teach or suggest the gap fill material of claim 1. The examiner would like to point out that Rutter et al. was only relied upon to show that an aperture fill material may comprise not only a polymer with hydroxyl groups and one or more crosslinking agents but also an acid catalyst, which catalyzes the crosslinking of the polymer and crosslinking agent.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANCA EOFF whose telephone number is (571)272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. E./
Examiner, Art Unit 1795

/Cynthia H Kelly/

Supervisory Patent Examiner, Art Unit 1795